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Forest Insect and Disease Management

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BIOLOGICAL
EVALUATION R2-77-10

MOUNTAIN PINE BEETLE

Shoshone National Forest
BLM, State and Private Lands
South Pass City and
Atlantic City, Wyoming

NOVEMBER 1977



Rocky Mountain Region

U.S. Department of Agriculture Forest Service

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INTRODUCTION

The mountain pine beetle, *Dendroctonus ponderosae* Hopkins, has been infesting lodgepole and limber pine in the Rock Creek and Beaver Creek drainages near Atlantic City, Wyoming for the past 13 years. In September, Wilmer Bailey, Forester and Vernon Creasap, Entomologist, conducted an aerial survey of the infestation in order to delineate the boundaries of the infestation. In October, Vernon Creasap and Biological Technicians, James Allen, Ronald MacDonald and Byron Plan, conducted a ground survey of the infestation. Eleven one-half-chain or one-chain wide and one-mile or one-and-one-quarter mile long cruise strips were run to collect build-up ratio and stand composition data. The purpose of this evaluation is to provide a current assessment of the infestation. A large timber sale involving State, private, Bureau of Land Management, and U. S. Forest Service lands was awarded to harvest infested and green trees over the next several years.

TECHNICAL INFORMATION

CAUSAL AGENT: *Dendroctonus ponderosae* Hopkins, mountain pine beetle

HOSTS: *Pinus contorta* var. *latifolia* Douglas, lodgepole pine
P. flexilis James, limber pine

LOCATION OF OUTBREAK: The outbreak is located on the southeastern end of the Wind River Mountain range near the historic mining towns of South Pass City and Miner's Delight (ghost town), in Wyoming (see location map, Figure 1). The beetles are causing mortality on lands of private ownership, State lands, and Federal lands administered by the National Forest Service and Bureau of Land Management.

TYPE OF DAMAGE: Tree killing varies from small groups of a few trees (5 or 6) to large groups of over 1,000. In some stands most of the trees 8" dbh and larger have been killed (Table 2).

LIFE HISTORY: The mountain pine beetle has one generation per year. Adults attack trees from July through August by boring through the bark to the cambium. The females then tunnel upward for 12 inches to 30 inches (these tunnels are called egg galleries). The females lay eggs in individual niches along each side of the gallery which is then packed with frass. After hatching, the larvae feed in individual channels (larval galleries) at right angles to the egg gallery in the phloem. The insect overwinters in the larval stage. In the spring, when the larvae are fully developed, they excavate an oval chamber at the end of the larval gallery and pupate. Finally, mature adults emerge from the chamber by boring through the outer bark and fly to attack new trees, completing the generation.

STAND DATA: A survey was conducted by FI&DM personnel. One-half-chain or one-chain wide and 80 to 100 chain long strips were run to determine a ratio of 1977 to 1976 infested trees. Every five chains, variable point plots were taken to obtain stand composition data.

RESULTS

There appear to be approximately 190,000 currently infested trees on about 23,000 acres of forested land (about 60% of the land being National Forest land). Tables 1 and 2 show the effects of the mountain pine beetle. Basal area (BA) of lodgepole pine has been reduced from an average of 107 sq. ft/ac to 71 sq. ft/ac. This represents a 33% reduction in BA, due primarily to the mountain pine beetle (there was some loss to *Comandra* blister rust *Comandra cronartium* Peck and environmental factors (e.g. suppression). The average percentage of pine trees in the stand over 8 inches dbh has been reduced from 37% to 32% (14% of the trees over 8 inches dbh). The average dbh of lodgepole pine has been reduced from 8.2 inches to 7.78 inches. Table 3 shows the average attack ratio to be one 1976 infested tree to 1.26 1977 infested trees. The ratios vary from 1 : 0.27 to 1 : 0.89 reductions in areas which were heavily infested in past years to 1 : 1.00 to 1 : 4.30 increases in areas into which the infestation is spreading.

Based on the aerial survey, lodgepole pine loss to the mountain pine beetle in 1976 was estimated to be 150,000 trees. This is 25,000 trees greater than estimated in last year's report, Creasap (1976). This year's aerial survey also showed the acreage to be more extensive than expected (see map).

DISCUSSION

Mountain pine beetle has been very active in large diameter lodgepole pine sawtimber type stands and will continue in these stands. Smaller diameter lodgepole pine sawtimber stands will suffer less loss from mountain pine beetle. Lodgepole pine epidemics diminish in intensity with an increase in elevation, Amman, et. al. (1973). The mountain pine beetle should continue to be very active in larger diameter stands at lower elevations.

Mountain pine beetle outbreaks in lodgepole pine must have larger diameters (11" and above) to sustain an epidemic, Cole and Amman (1969).

The most effective method of suppressing the mountain pine beetle in lodgepole pine is through a combined program of logging infested trees and timely silvicultural treatment to remove or reduce the inventory of large diameter highly susceptible trees, Amman, et. al. (1977). Suppression efforts should not rely entirely on salvage logging of infested trees. Epidemic potential remains as long as there is a high inventory of large diameter lodgepole pine. The beetles usually are epidemic in a stand until the average diameter of the stand is reduced below 8 inches. Reduction of the inventory of larger diameter, susceptible trees can provide conditions to improve the growth of smaller diameter trees. Removal of dwarf mistletoe and Comandra rust infested trees should be included in the thinning operation. The data from this years build-up ratio cruises indicate that mountain pine beetle losses will continue to rise compared to 1976 losses.

The infestation is expected to spread into the Hidden Creek drainage, further into the Freak Mountains and towards Meyer Basin (north of Wolf point). Two groups outside of the main area of the infestation, located south of Louis Lake and on Fossil Hill (six miles north of Fiddler's Lake) may be expected to expand.

CONCLUSIONS

Present efforts on the existing timber sale should be continued. Since the infestation has spread well beyond the boundary of the timber sale, plans for adjacent timber sales should be made. Concurrent salvaging of currently infested timber and reducing the average dbh of the residual stand is imperative to control of the mountain pine beetle in lodgepole pine.

ALTERNATIVES

Alternative 1: Silvicultural treatment of all operable stands to remove most trees 8 inches dbh and larger will effectively reduce susceptibility of stands to mountain pine beetle attack for periods of 20 years or more. Uneven age stand management often requires partial cutting in stands every 20 years. Therefore, the concept of removing trees 8 inches dbh and larger, with the expected protection of the stand from beetle attack for 20 years or more, agrees with current silvicultural management techniques.

Alternative 2: Salvaging of infested timber would remove dead or dying trees so that they may be utilized rather than wasted. This proposal will not reduce the susceptibility of the stands to mountain pine beetle attack. The stands may become reinfested within a few years. Salvage logging should only be used in areas where the remaining stand will receive silvicultural treatment within 3 or 4 years. Salvage logging alone is only a temporary measure to reduce beetle populations and cannot be expected to give protection to a stand for more than 3 or 4 years.

Alternative 3: Doing nothing to alleviate the pressure of mountain pine beetle attack on lodgepole pine forests cannot generally be justified from a management point of view. The mountain pine beetle, in epidemic proportions, will probably reduce growing stock below satisfactory levels for timber management. Leaving a "sea of snags" is not aesthetically pleasing. Some effort should be made to remove dead or dying trees and allow the forest to regenerate. Dead trees will also increase fire hazard for a few years. During periods of very high or extreme fire danger, forest use may have to be restricted or entirely closed down during high recreational use times because of the low fuel moisture content of large amounts of available fuel. Fire may further reduce timber inventory.

Alternative 4: Direct control alone, either by chemical treatment or burning of infested timber, may be an alternative in a few cases in Region 2. In order to use direct control a benefit/cost analysis should be done. Silviculturally or biologically, direct control cannot be justified. Direct control is only a temporary course of action which will not protect a stand from beetle attack for more than 3 or 4 years. Furthermore, the treated trees are not utilized and no return is realized on the high investment needed for direct control.

RECOMMENDATIONS

Of the alternatives, number 1 is recommended as the primary tool for land managers. Alternative 2 should only be used when an area is to receive silvicultural treatment in the next 3 or 4 years. Alternative 3 should be put into effect in inaccessible areas where a choice of alternatives does not exist. Alternative 4 is not recommended for general application. Land managers should do a benefit/cost analysis to determine whether or not alternative 4 could be beneficial.

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TABLE 1 BASAL AREA SUMMARY
(square feet per acre)

Area	Number of Plots in Type	Total Stand Live & Dead	LODGEPOLE PINE						LIMBER PINE			
			All Live and Dead	1977 Infested	1976 Infested	Older Infested	Other ^{1/} Dead	Live Residual	All Live and Dead	1976 Infested	Other Dead	Live Residual
Beaver Creek North	19	140	112	14	2	3	-	94	--	-	-	--
Beaver Creek South	17	138	120	6	31	29	1	53	--	-	-	--
Fiddler Lake	20	154	141	--	--	--	9	132	11	-	1	10
Freak Mountains	18	109	97	21	7	16	1	52	--	-	-	--
Grannier Meadow	19	127	99	--	--	2	2	95	22	-	-	22
Little Popo Aige	20	123	123	--	1	--	5	117	--	-	-	--
Louis Creek	19	104	101	2	2	2	2	93	3	-	-	3
Miner's Delight (BLM)	16	61	59	5	8	9	1	35	1	-	-	1
Pass Creek North	16	109	102	36	6	12	-	48	--	-	-	--
Pass Creek South	16	110	101	20	15	20	-	46	2	-	-	--
Rock Creek Reservoir	20	136	114	6	9	44	2	53	5	1	1	3
TOTAL	200											
AVERAGE		119	107	9	7	12	2	71	44	1-	1-	4

^{1/}

Primarily mortality from *Comandra coronatum*

TABLE 2 SUMMARY AVERAGE DBH OF HOST SPECIES (inches)

Area	LODGEPOLE PINE						LIMBER PINE					Trees of 8" DBH (percent pine) All Live & Dead Residual	
	All Live and Dead	1977 Infested	1976 Infested	Older Infested	Other Dead	Residual	All Live and Dead	1977 Infested	1976 Infested	Other Dead	Residual		
Beaver Creek North	7.49	8.54	8.96	6.38	-----	7.40	-----	-----	-----	-----	-----	26.71	24.95
Beaver Creek South	8.94	10.76	9.13	9.64	-----	8.64	-----	-----	-----	-----	-----	40.07	39.60
Fiddler's Lake	9.55	-----	-----	-----	8.46	9.60	8.46	-----	-----	8.78	8.38	54.78	55.17
Freak Mountains	7.40	9.23	11.47	11.46	11.00	6.23	-----	-----	-----	-----	-----	25.37	17.77
Grannier Meadow	8.39	8.55	10.87	12.34	6.78	8.40	7.34	-----	-----	-----	7.34	51.59	51.62
Little Pogo Agie	7.61	11.45	11.73	-----	9.04	7.55	-----	-----	-----	-----	-----	26.89	25.66
Louis Creek	8.58	13.73	14.32	10.37	10.94	8.45	9.10	-----	-----	-----	9.10	34.83	31.56
Miner's Delight (BLM)	8.00	9.10	9.59	9.89	5.70	7.50	7.34	-----	-----	-----	7.34	40.45	21.16
Pass Creek North	7.67	10.27	11.05	9.25	-----	6.23	-----	-----	15.10 ^{1/}	-----	-----	40.82	17.09
Pass Creek South	8.41	10.65	10.59	10.94	-----	7.08	6.74	9.70	-----	-----	6.70	35.92	19.16
Rock Creek Reservoir	8.42	9.28	10.49	10.02	8.08	7.44	9.69	-----	8.44	19.50	10.35	39.13	24.85
AVERAGE	8.20	9.69	9.97	10.08	7.27	7.78	7.79	9.70	8.59	11.57	7.75	37.24	31.77

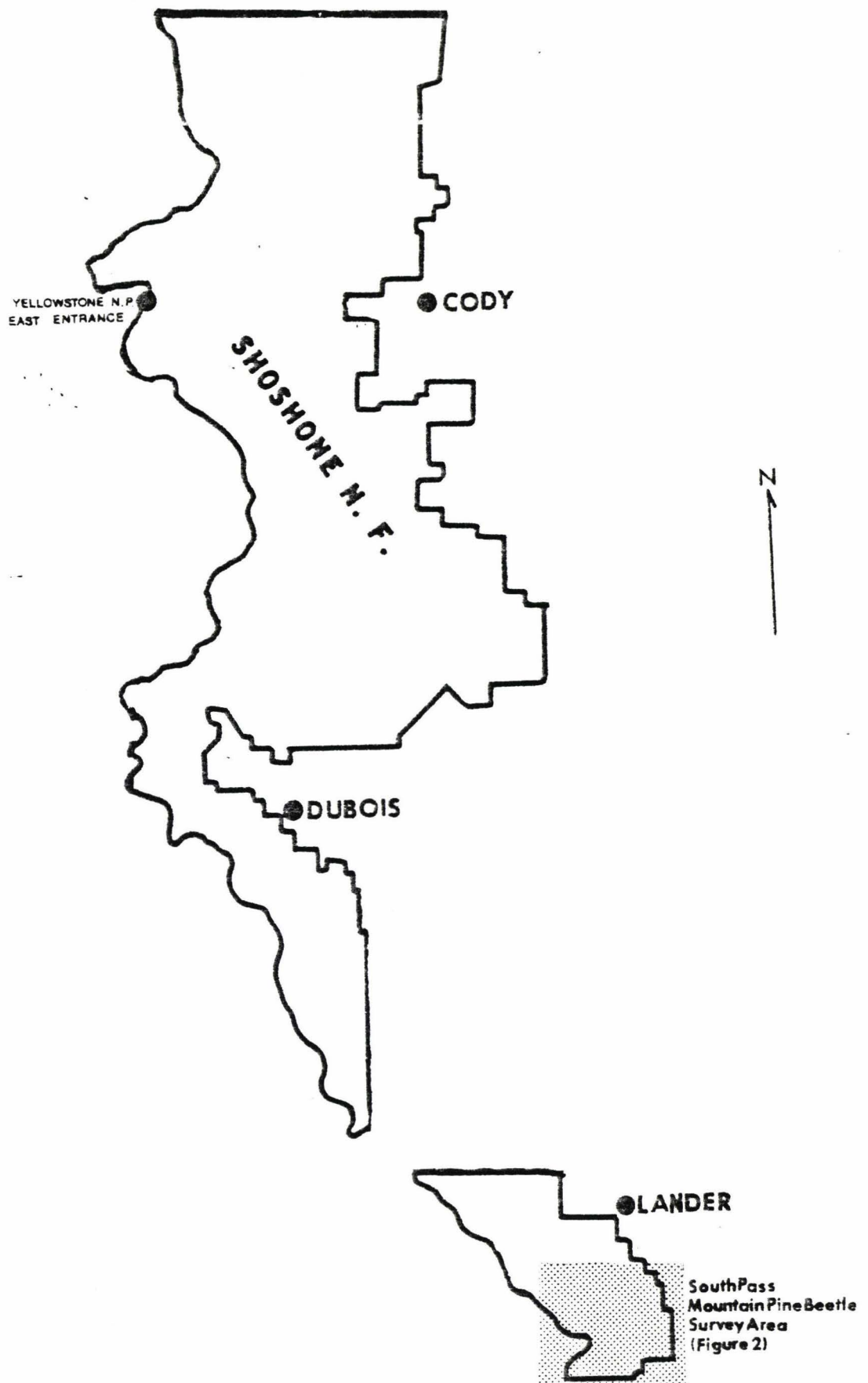
^{1/}

One infested Limber Pine found on the strip - none on the variable plots

TABLE 3 STRIP CRUISE DATA SUMMARY

Area	Strip Width (Chains)	Miles of Line	BAF	Average Elevation (feet)	Infested Trees (Lodgepole & Limber Pines)	
					1977	1976
Beaver Creek North	1	1.25	10	8,200	187	55
Beaver Creek South	1	1.00	20	8,100	113	418
Fiddler's Lake	$\frac{1}{2}$	1.25	10	9,400	---	---
Freak Mountains	$\frac{1}{2}$	1.00	20	8,000	327	76
Grannier Meadow	$\frac{1}{2}$	1.25	10	9,100	2	3
Little Popo Agie	$\frac{1}{2}$	1.25	10	8,500	2	2
Louis Creek	$\frac{1}{2}$	1.25	10	8,800	26	10
Miner's Delight (BLM)	$\frac{1}{2}$	1.00	10	8,600	30	40
Pass Creek North	$\frac{1}{2}$	1.25	20	7,900	315	66
Pass Creek South	$\frac{1}{2}$	1.25	20	8,300	92	169
Rock Creek Reservoir	$\frac{1}{2}$	1.25	10	8,600	90	101
TOTAL		13.00			1,184	940
AVERAGE				8,500 (7,900 to 9,400)		
BUILD-UP RATIO					1 : 1.26	

FIGURE 1
SURVEY AREA MAP LOCATION



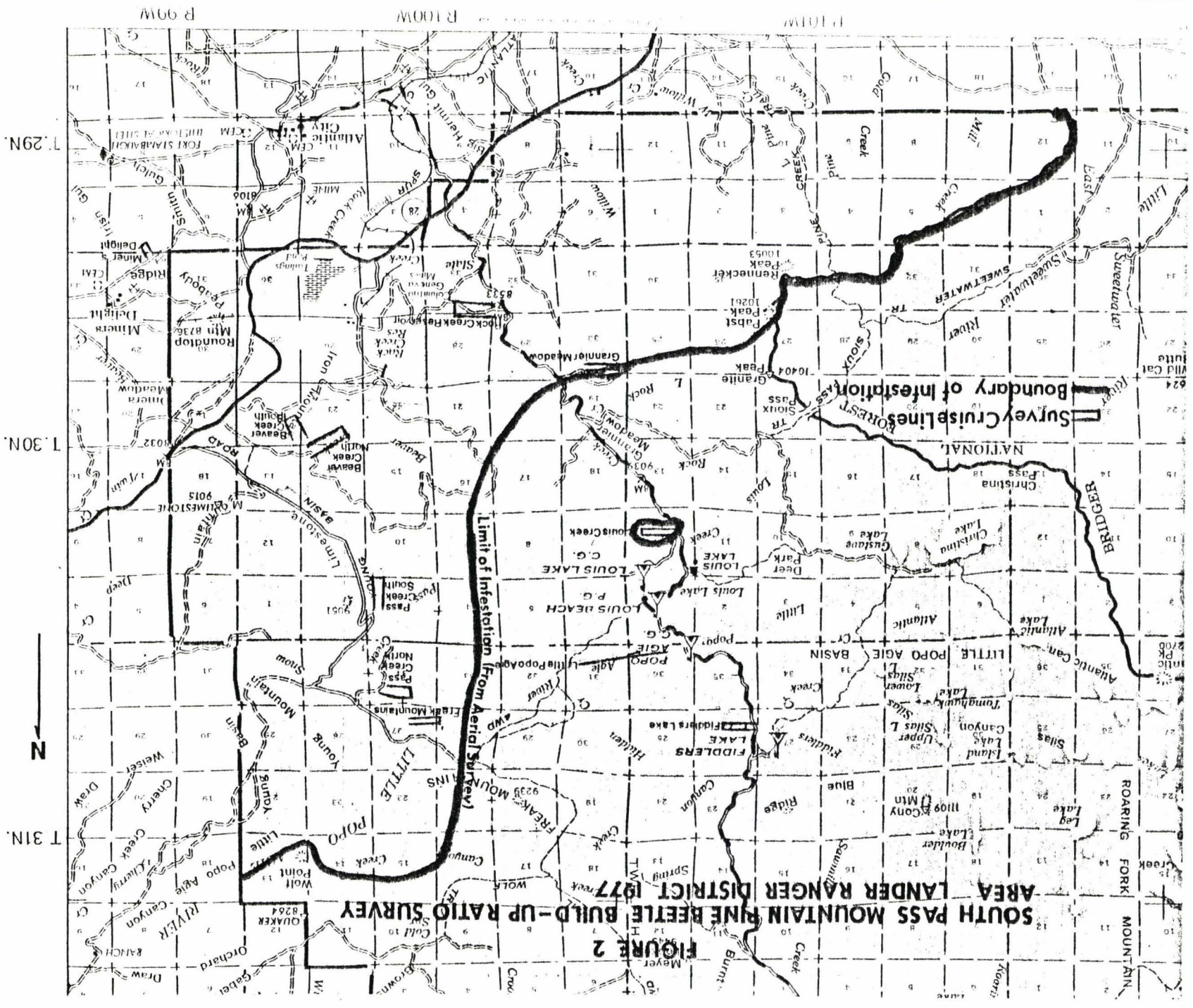


FIGURE 2
SOUTH PASS MOUNTAIN PINE BEETLE BUILD-UP RATIO SURVEY
AREA LANDER RANGER DISTRICT 1977

T 29N
 T 30N
 T 31N
 N

R 90W

R 100W

R 110W